

DISCRETE MATHEMATICS

Molecular descriptors in chemical graph theory

supervisor: prof. RNDr. Tomáš Madaras, PhD. (tomas.madaras@upjs.sk)

study form: full time

Annotation: The aim of the research in the proposed topic is to study mathematical properties of selected graph invariants - so called molecular descriptors - which are currently or potentially applicable in the research of physical and chemical properties of chemical compounds (based on the graph structure of their molecules). The attention will be focused mainly on the study of bounds on these invariants in terms of various graph parameters for graphs in general as well as for graphs from specific graph families, on the relationship of different molecular descriptors and on the study of important inequalities that molecular descriptors may satisfy (as are analogues of Zagreb inequality, Nordhaus-Gaddum-type relations etc.).

Generalised graph colourings

supervisor: doc. RNDr. Roman Soták, PhD. (roman.sotak@upjs.sk)

study form: full time

Annotation: To study different chromatic characteristics of graphs, among other things DP-chromatic number and Alon-Tarsi number. To investigate their generalisations corresponding to the list version or its analogues, respectively. To focus on new proof techniques in this area as are Nullstellensatz or else entropy compression.